Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (**withdrawn**) A method for estimating the number of bits output from a video coder given a known spatial data content, $G = \{g_1,...,g_N\}$. of a group of luminance and chrominance blocks, and a known coding mode, d, where d represents the index of said coding mode, the method comprising the steps of:

(a) extracting a significant part of said spatial data content, G, in relation to said coding mode, d, to yield a feature vector F, said feature vector representing statistics and signal components of the luminance and chrominance data of said luminance and chrominance blocks;

(b) mapping said feature vector to yield a class index, c, for said respective group of luminance and chrominance blocks;

(c) mapping said class index, c, in relation to a quantization parameter, q, where said quantization parameter controls the scale of quantizer bin size, to an estimate of the number of quantization bits for said group of luminance and chrominance blocks; and

(d) determining an estimated total number of coding bits for said group of luminance and chrominance blocks from the combination of said estimated number of quantization bits and an estimated number of overhead bits, wherein said overhead bits represent the additional bits expended to represent respective portions of the bitstream.

2. (**withdrawn**) The method of claim 1, wherein said class index mapping step is performed by a two-to-one mapping.

3. (**withdrawn**) The method of claim 1, wherein said extracting step comprises the following steps:

(a) assigning a first predetermined feature representative of the coding mode to one component of said feature vector; and

(b) computing a second feature representative of said spatial content data and assigning said second feature to one component of said feature vector.

4. (**withdrawn**) The method of claim 3, wherein said computing step determines said second feature according to the following equation:

$$\sigma = \left(\frac{1}{|G|} \sum_{j \in \{1,\ldots,N\}} \sum_{(x,y) \in g_j} \left| I(x,y) - d\,\bar{I}_j \right|^L \right)^{\frac{1}{L}}$$

where $\bar{I}_j$ represents the mean of j'th block, $(j \in \{1,\ldots N\})$ and is defined as

$$\bar{I}_j = \frac{1}{|g_j|} \sum_{(x,y) \in g_j} I(x,y)$$

, with *I* representing the value of either luminance or chrominance (*d* = 1) or the motion compensated value thereof *(d = 0),* $|\,.\,|$ denoting the cardinality of its operand and $L \geq 1$.

5. (**withdrawn**) The method of claim 1, wherein said class index mapping step operates with a uniform scalar quantizer.

6. (**withdrawn**) The method of claim 1, wherein said estimator mapping step determines said estimated number of quantization bits according to the following equation:

$$\hat{B}(g_1,\ldots,g_N,d,q) = U(c,q) = E\left[B(g_1,\ldots,g_N,d,q) \middle| V(T(g_1,\ldots,g_N,d)) = c\right]$$

7. (**withdrawn**) The method of claim 6, wherein the expected value in the equation is further estimated from the actual number of quantization bits for previously encoded groups of blocks.

8. (**withdrawn**) The method of claim 7, wherein said estimation of the expected value for R^{th} group of blocks is performed according to the following equation

$$B(g_1^R,\ldots,g_N^R,d^R,q)=U(c^R,q)=U^R(c^R,q)$$

$$U^R(c,q)=\frac{1}{P_{c,q}^{R-1}}\sum_{\substack{r:r<R,\\ Q^r=q,\\ V(T(g_1^r,\ldots,g_N^r,d^r))=c}} B(g_1^r,\ldots,g_N^r,d^r,Q^r)$$

where $P_{c,q}^{X}$ is the number of macroblocks prior to and including X'th macroblock which are of class *c* and are coded with parameter *q*.

9. (**withdrawn**) The method of claim 7, wherein, if the number of groups of blocks is

$U^R(c,q)=U^{kZ}(c,q)\ for\ kZ<R\leq(k+1)Z$, with

$$U^{kZ}(c,q)=\begin{cases}\dfrac{P_{c,q}^{(k-1)Z}\,U^{(k-1)Z}(c,q)+\sum_{\left\{\substack{r:(k-1)Z<r\leq kZ,\\ V(T(g_1^r,\ldots,g_6^r,d^r))=c\\ Q^r=q}\right\}} B(g_1^r,\ldots,g_6^r,d^r,Q^r)}{P_{c,q}^{kZ}} & \text{if } P_{c,q}^{kZ}>P_{c,q}^{(k-1)Z}\\ U^{(k-1)Z}(c,q) & \text{else}\end{cases}$$

10. (**withdrawn**) The method of claim 9, wherein the number of actual quantization bits for the most recently quoted groups of blocks are emphasized by scaling

$P_{c,q}^{kZ}\ \&\ P_{c,q}^{(K-1)Z}$

11. (**withdrawn**) The method of claim 10, wherein said emphasizing is determined according to the following equation:

$$P_{c,q}^{kZ} = P_{c,q}^{kZ}/2 \;\; if \;\; P_{c,q}^{kZ} > P_{c,q}^{max},$$
$$P_{c,q}^{(k-1)Z} = P_{c,q}^{(k-1)Z}/2 \;\; if \;\; P_{c,q}^{kZ} > P_{c,q}^{\max}$$

where $P_{c,q}^{max}$ is a threshold.

12. (**withdrawn**) The method of claim 1, wherein said estimated number of overhead bits is determined according to the following equation:

$$\hat{B}_{OV}^{R}(q) = \begin{cases} 1 & if \; \frac{1}{384} \sum_{j \in \{1,\ldots,6\}} \sum_{(x,y) \in g_j^R} | I^{FD}(x,y) |^L < h(q) \\ \overline{B}_{OV} & \text{else} \end{cases}$$

where $\overline{B}_{OV}$ is the average number of overhead bits of coded groups of blocks of a previously coded picture and *h(q)* is a function of *q* .

13. (**withdrawn**) A method for assigning quantization parameters to the groups of blocks of a picture comprising the steps of:

i. setting the quantization parameters of all groups of blocks of the picture equal to the largest value allowed by the video coding standard;

ii. scanning said groups of blocks according to a certain scanning order, where the last group of blocks in the scanning order is followed by the first group of blocks;

iii. determining whether to code the next group of blocks in the said scanning order with the quantization parameter for the group of blocks;

iv. decrementing the quantization parameter of said group of blocks;

v. repeating steps (b)-(d) until the sum of the estimates for the number of coding bits of all of said groups of blocks exceeds the targeted number of coding bits, B^{TR}, for the picture.

14. (**withdrawn**) The method of claim 13, wherein the first, Z_o, of a number Z of groups of blocks are quantized with a quantization parameter of *q*, and the remaining number, $Z- Z_o$,of groups of blocks are quantized with a quantization parameter of *q*+1.

15. (**withdrawn**) The method of claim 13, wherein a group of blocks is coded if the following inequality is satisfied:

$$\frac{1}{384}\sum_{j\in\{1,\ldots,6\}}\sum_{(x,y)\in g_j^n}|I^{FD}(x,y)|^L \geq h(q)$$

16. (**withdrawn**) The method of claim 13, wherein said repeating step is terminated according to the following equation:

$$\sum_{r\in\{kZ+1,\ldots,(k+1)Z\}} U^r(c^r,q^r)+\hat{B}^r_{OV}(q^r)>B^{TR}$$

17. (**currently amended**) A signal coding apparatus, comprising:

a partitioning component that divides a field of data into a plurality of data groups (macroblocks);

a transform component that encodes respective ones of said plurality of data groups, said data groups represented by respective transform coefficients;

a quantizing component that compresses said respective transform coefficients representing said plurality of data groups;

a compressing component that further compresses said quantized transform coefficients; and

a rate control component that maps each of a plurality of unique pairs of data, pairs of data being characterized as a first component of particular class data paired with a second component of particular quantization parameter data, ~~of a class of features of said groups of data, and a quantization parameter~~ to a unique estimate for a number of coding bits, wherein ~~spatial data content and~~ a value representing an actual quantity of coding bits observed for previously coded data entities is ~~mode are~~ factored into the estimation process ~~by the utilization of said class of features~~.

18. **(original)** The apparatus of claim 17, wherein said features of said groups of data comprises data indicating pixel luminance intensity values and corresponding pixel chrominance intensity values.

19. **(previously presented)** The apparatus of claim 17, wherein said transform component comprises a two-dimensional orthogonal transform.

20. **(previously presented)** The apparatus of claim 17, wherein said compressing component comprises a run-length coder and a variable length coder.

21. **(original)** The apparatus of claim 19, wherein said orthogonal transform comprises a discrete cosine transform operating on one of the intensity values of the pixels of a group of data, and the error of the temporal prediction from one or more temporally local groups of data.

22. **(previously presented)** The apparatus of claim 17, wherein said quantizing component comprises a uniform scalar quantizer.

23. **(withdrawn)** A method for estimating the number of bits output from a video coder given a known spatial data content, $G = \{g_1, \ldots, g_N\}$, of a group of luminance and

chrominance blocks, and a known coding mode, d, where d represents the index of said coding mode, the method comprising the steps of:

(a) extracting a significant part of said spatial data content, G, in relation to said coding mode, d, to yield a feature vector F, said feature vector representing statistics and signal components of the luminance and chrominance data of said luminance and chrominance blocks;

(b) mapping said feature vector to yield a class index, c, for said respective group of luminance and chrominance blocks; and

(c) mapping said class index, c, in relation to a quantization parameter, q, where said quantization parameter controls the scale of quantizer bin size, to an estimate of the number of coding bits for said group of luminance and group of chrominance blocks, wherein said coding bits comprise the quantization and overhead bits and said overhead bits represent the additional bits expended to represent respective portions of bitstsream.

24. – 27. **(canceled)**

28. **(previously presented)** The apparatus of claim 19, wherein said features of said groups of data comprises data indicating pixel luminance intensity values and corresponding pixel chrominance intensity values.

29. **(previously presented)** The apparatus of claim 20, wherein said transform component comprises a two-dimensional orthogonal transform.

30. **(previously presented)** The apparatus of claim 29, wherein said orthogonal transform comprises a discrete cosine transform operating on one of the intensity values of the pixels of a group of data, and the error of the temporal prediction from one or more temporally local groups of data.

31. (**previously presented**) The apparatus of claim 18, wherein said compressing component comprises a run-length coder and a variable length coder.

32. (**previously presented**) The apparatus of claim 18, wherein said quantizing component comprises a uniform scalar quantizer.

33. (**previously presented**) The apparatus of claim 20, wherein said features of said groups of data comprises data indicating pixel luminance intensity values and corresponding pixel chrominance intensity values.

34. (**previously presented**) The apparatus of claim 22, wherein said transform component comprises a two-dimensional orthogonal transform.

35. (**previously presented**) The apparatus of claim 22, wherein said compressing component comprises a run-length coder and a variable length coder.

36. (**currently amended**) A signal coding apparatus, comprising:

a partitioning component that divides a field of data into a plurality of data groups (macroblocks), wherein respective ones of said plurality of data groups further comprise a spatial data content;

a transform component that encodes respective ones of said plurality of data groups, said data groups represented by respective transform coefficients, and wherein respective ones of said plurality of data groups further comprise a coding mode;

a quantizing component that compresses said respective transform coefficients representing said plurality of data groups;

a compressing component that further compresses said quantized transform coefficients; and

a rate control component that maps each of a plurality of unique pairs of data, pairs of data being characterized as a first component of particular class data paired with a second component of particular quantization parameter data, ~~of a class of features of said groups of data, and a quantization parameter~~ to a unique estimate for a number of coding bits, wherein ~~spatial data content and~~ a value representing an actual quantity of coding bits observed for previously coded data entities is ~~mode are~~ factored into the estimation process ~~by the utilization of said class of features~~.

37. (**previously presented**) The apparatus of claim 36, wherein said features of said groups of data comprises data indicating pixel luminance intensity values and corresponding pixel chrominance intensity values.

38. (**previously presented**) The apparatus of claim 36, wherein said transform component comprises a two-dimensional orthogonal transform.

39. (**previously presented**) The apparatus of claim 36, wherein said compressing component comprises a run-length coder and a variable length coder.

40. (**previously presented**) The apparatus of claim 38, wherein said orthogonal transform comprises a discrete cosine transform operating on one of the intensity values of the pixels of a group of data, and the error of the temporal prediction from one or more temporally local groups of data.

41. (**previously presented**) The apparatus of claim 36, wherein said quantizing component comprises a uniform scalar quantizer.